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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,883	11/14/2003	Jin Hui Cho	CU-3453 RJS	1105
26530	7590	07/27/2005	EXAMINER	
LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604			SCHECHTER, ANDREW M	
			ART UNIT	PAPER NUMBER
			2871	

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

SM

Office Action Summary

Application No.

10/713,883

Applicant(s)

CHO ET AL.

Examiner

Andrew Schechter

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 May 2005.
- 2a) ☐ This action is **FINAL**: 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 5 and 16-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-11 and 13-15 is/are rejected.
- 7) ☒ Claim(s) 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: NPL documents (2)

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Objections

2. Claim 10 is objected to because of the following informalities: "the determined concave/convex angles" should be "determined concave/convex angles". Appropriate correction is required.
3. Claim 12 is objected to because of the following informalities: "organic insulating film" should be "resin layer". Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 2 and 3 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The term "backside exposure" is usually used in the art to refer to a self-aligned exposure, where opaque layers which have already been deposited on the substrate act as a mask for exposing a photoresist above them. Claim 2 recites "backside exposure to remove a portion of the resin layer remaining below the contact hole", which the examiner understands to mean finishing forming the contact hole (making Fig. 1C become Fig. 1D). The problem is that there does not appear to be any lower opaque layers which could act as a mask to do this in a self-aligned manner. The specification gives no details on how this backside exposure is carried out. Is it meant to be backside exposure without any self-alignment? Is there another mask formed on the outside of the substrate exactly matching the partially formed contact holes, or is there some form of self-alignment not explicitly stated? What is the best mode for carrying out the claimed invention? Since this process is not described in sufficient detail to understand exactly what is being done and how it is to be done, claim 2 is rejected. Clarification by the applicant would be appreciated.

Claim 3 depends on claim 2.

6. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 11 recites "completely removing a portion of the protective layer to obtain an additional step height difference of about 4,000 Angstroms or more". As far as the examiner can tell, this is not shown in any of the figures (does the applicant believe it is

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shown in one of the figures?). Is it 4,000 Angstroms total step height or additional on top of what it would be if the protective layer were not removed? That is, does it just mean that the protective layer is 4,000 Angstroms or more thick and is removed only at the region of the concave/convex portions, not at the contact hole portion? How is this possible, since if it is not removed at the contact hole portion, there would not be electrical contact between the pixel electrodes and the TFT? All the figures show it removed at both portions. Claim 11 is therefore rejected.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 2 and 3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As discussed above, it is unclear what process is meant by the "backside exposure" recited in claim 2. Claim 3 depends on claim 2.

9. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites "1-4 μm or 2.5-3 μm " which is indefinite so the scope of the claim is unclear. See MPEP 2173.05(c). For examining purposes, this is assumed to mean 1-4 μm .

10. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As discussed above, it is unclear what is meant by this claim and how it is done.

11. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 recites "the contact hole is formed as large as the transmissive region ... to the same size at the same position as the transmissive region". Again, this is not shown in any figure. In Fig. 3, for instance, the "transmissive region B" is not transmissive at all since the reflective electrode covers the whole region. It cannot be patterned in a later step to fix this problem, since the reflective electrode must fill the contact hole to electrically connect to the TFT. For examining purposes, it is assumed that a contact hole such as in *Okamoto* (see below) is intended.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Okumura*, U.S. Patent No. 6,894,747 in view of *Kawasaki*, U.S. Patent No. 4,807,973.

Okumura discloses [see Fig. 8, for instance] a method for manufacturing a transfective thin film transistor liquid crystal display, comprising forming a gate electrode [20] on an insulating substrate [14], forming a gate insulating film [15], forming an active layer [21], forming source/drain electrodes [22, 23], forming a protective film [17], forming a resin layer [18], exposing the resin layer to light through one mask [43, see Fig. 3], so that a contact hole is formed at one region of the resin layer and concave/convex portions having the desired concave/convex portions are formed on the other region of the resin layer [Fig. 8C], and forming a reflective electrode [19] on the entire upper surface of the resulting substrate including the contact hole and the concave/convex portions.

Okumura does not disclose forming an ohmic contact layer on the active layer, which is then overlapped by the source/drain electrodes. *Kawasaki* discloses [see Fig. 7] such an ohmic contact layer [26, 27] on the analogous active layer, and overlapped by the source/drain electrodes. It would have been obvious to one of ordinary skill in the art at the time of the invention to have such an ohmic contact layer, motivated by *Kawasaki's* teaching that this improves the ohmic contact between the semiconductor of the active layer and the metal of the source/drain electrodes [col. 4, lines 3-8]. Claim 1 is therefore unpatentable.

The resin layer is formed 3 μm thick [col. 4, lines 55-59], so claim 4 is also unpatentable.

14. Claims 1, 4, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Okamoto et al.*, U.S. Patent No. 6,900,863 in view of *Numano et al.*, U.S. Patent No. 6,313,898 and *Ichimura*, Japanese Patent Document No. 09-090426.

Okamoto discloses [see Fig. 24] a method for manufacturing a transfective thin film transistor liquid crystal display, comprising forming a gate electrode [23] on an insulating substrate [29], forming a gate insulating film and a TFT structure [21], forming a resin layer [25], with a contact hole formed at one region of the resin layer and concave/convex portions having the desired concave/convex portions are formed on the other region of the resin layer [Fig. 8C], and forming a reflective electrode [19] on the entire upper surface of the resulting substrate including the contact hole and the concave/convex portions.

Okamoto discloses forming a TFT with an active layer, but the ohmic contact layer and source/drain electrodes are not clearly labeled, and it does not appear to have an analogous protective film. *Numano* discloses an analogous TFT structure [see Fig. 3] with active layer [5], ohmic contact layer [6], source/drain electrodes [7a, 8], and protective film [9] below the analogous resin layer [10]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such ohmic contact layers and source/drain electrodes, motivated by the desire to have a functioning TFT with good electrical contact, and to use such a protective film, motivated by *Numano's* teaching that this layer protects the channel portion of the active layer [col. 8, lines 39-40].

Okamoto does not disclose exposing the resin layer to light through one mask to form the contact hole and the concave/convex portions. *Ichimura* discloses doing so, and it would have been obvious to one of ordinary skill in the art at the time of the invention to do so in the device of *Okamoto*, motivated by *Ichimura*'s teaching that this allows the contact hole and surface roughness to be formed simultaneously with a simple process [0030]. Claim 1 is therefore unpatentable.

The resin has a thickness of 3 μm [col. 69, line 5], so claim 4 is also unpatentable. The contact hole is formed as large as the transmissive region such that the contact hole is formed to the same size at the same position as the transmissive region, so claim 15 is also unpatentable.

15. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Kim*, U.S. Patent No. 6,750,932 in view of *Numano et al.*, U.S. Patent No. 6,313,898 and *Ichimura*, Japanese Patent Document No. 09-090426.

Kim discloses [see Fig. 7] a method for manufacturing a transfective thin film transistor liquid crystal display, comprising forming a gate electrode [222] on an insulating substrate [210], forming a gate insulating film [230], an active layer [241], ohmic contact layer [251], and source/drain electrodes [262, 263], forming a resin layer [270], with a contact hole formed at one region of the resin layer, and forming a reflective electrode [300] on the entire upper surface of the resulting substrate.

Kim does not disclose a protective film below the resin layer. *Numano* discloses a protective film [9] below the analogous resin layer [10]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such a protective film,

motivated by *Numano*'s teaching that this layer protects the channel portion of the active layer [col. 8, lines 39-40].

Kim does not disclose the concave/convex portions and exposing the resin layer to light through one mask to form the contact hole and the concave/convex portions. *Ichimura* discloses having such concave/convex portions and using a single mask to form both, and it would have been obvious to one of ordinary skill in the art at the time of the invention to do so in the device of *Okamoto*, motivated by *Ichimura*'s teaching that this allows the contact hole and surface roughness to be formed simultaneously with a simple process [0030], and concave/convex portions are desirable in the reflective region to convert specular (mirror) reflection to diffusive scattering reflection to improve the display quality [0006]. Claim 1 is therefore unpatentable.

A region of the substrate where the contact hole is formed has a greater step height than a region of the substrate where the concave/convex portions are formed [by the thickness of the drain electrode 263], so claim 7 is also unpatentable.

16. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Kim* in view of *Numano* in view of *Ichimura* as applied above, and further in view of *Nakamura*, U.S. Patent No. 6,674,499.

The step height difference is the thickness of the drain electrode 263, but its actual thickness is not disclosed. *Nakamura* discloses for an analogous device that a thickness of 0.3-0.5 μm is appropriate [col. 4, lines 65-66]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such a thickness,

motivated by *Nakamura's* teaching that this thickness is appropriate for a drain electrode. Claim 9 is therefore unpatentable.

17. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Kim* in view of *Numano* in view of *Ichimura* as applied above, and further in view of *Shimada et al.*, U.S. Patent No. 6,147,722.

The reflective electrode and the transparent electrode come in contact with each other through the contact hole in the above device, but the references are silent on the width of the contact hole. *Shimada* discloses an analogous contact hole which is "typically about 4 μm " in width [col. 18, lines 55-67]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such a width, motivated by *Shimada's* teaching that this is an appropriate width for contact holes which produces a good quality display. Claim 14 is therefore unpatentable.

18. Claims 1, 3, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Wei et al.*, US 2003/0133059 in view of *Kawasaki*, U.S. Patent No. 4,807,973 and *Ichimura*, Japanese Patent Document No. 09-090426.

Wei discloses [see Fig. 3, for instance] a method for manufacturing a transfective thin film transistor liquid crystal display, comprising forming a gate electrode [232a] on an insulating substrate [210], forming a gate insulating film, forming an active layer [239], forming source/drain electrodes [234a,b], forming a protective film [237], forming an insulating layer [295], so that a contact hole is formed at one region of the resin layer and concave/convex portions having the desired concave/convex portions are formed on the other region of the resin layer, and forming a reflective

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electrode [19] on the entire upper surface of the resulting substrate including the contact hole and the concave/convex portions.

Wei does not disclose forming an ohmic contact layer on the active layer, which is then overlapped by the source/drain electrodes. *Kawasaki* discloses [see Fig. 7] such an ohmic contact layer [26, 27] on the analogous active layer, and overlapped by the source/drain electrodes. It would have been obvious to one of ordinary skill in the art at the time of the invention to have such an ohmic contact layer, motivated by *Kawasaki's* teaching that this improves the ohmic contact between the semiconductor of the active layer and the metal of the source/drain electrodes [col. 4, lines 3-8].

Wei does not disclose exposing the resin layer to light through one mask. (*Wei* also does not explicitly state that the insulating layer is made of resin.) *Ichimura* does disclose using a resin layer and exposing the resin layer to light through one mask to form the contact hole and the concave/convex portions. It would have been obvious to one of ordinary skill in the art at the time of the invention to do so in the device of *Wei*, motivated by *Ichimura's* teaching that this allows the contact hole and surface roughness to be formed simultaneously with a simple process [0030]. Claim 1 is therefore unpatentable.

Wei also discloses the steps of partially removing the protective film and then forming a transparent electrode [216] on the exposed portions of the drain electrode and the insulating substrate, before the step of forming the resin layer. Claim 3 is therefore unpatentable. The contact hole is formed as large as the transmissive region such that

the contact hole is formed to the same size at the same position as the transmissive region, so claim 15 is also unpatentable.

19. Claims 1, 7, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Tanaka et al.*, U.S. Patent No. 6,509,942 in view of *Okumura*, U.S. Patent No. 6,894,747 and *Ichimura*, Japanese Patent Document No. 09-090426.

Tanaka discloses [see Figs. 2 and 3, for instance] a method for manufacturing a thin film transistor liquid crystal display, comprising forming a gate electrode [22] on an insulating substrate [10], forming a gate insulating film [32], forming an active layer [34], forming an ohmic contact layer [36s,d], forming source/drain electrodes [30s,d], forming a protective film [40], forming a resin layer [18], so that a contact hole is formed at one region of the resin layer and concave/convex portions having the desired concave/convex portions are formed on the other region of the resin layer, and forming a reflective electrode [12] on the entire upper surface of the resulting substrate including the contact hole and the concave/convex portions.

Tanaka does not disclose making the device transfective. *Okumura* discloses making an analogous device transfective by adding a transparent pixel electrode as shown in Fig. 7. It would have been obvious to one of ordinary skill in the art at the time of the invention to do so, motivated by the desire to have the device usable in both bright and dark environments.

Tanaka does not disclose exposing the resin layer to light through one mask. *Ichimura* does disclose exposing the resin layer to light through one mask to form the contact hole and the concave/convex portions. It would have been obvious to one of

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ordinary skill in the art at the time of the invention to do so in the device of *Tanaka*, motivated by *Ichimura*'s teaching that this allows the contact hole and surface roughness to be formed simultaneously with a simple process [0030]. Claim 1 is therefore unpatentable.

A region of the substrate where the contact hole is formed has a greater step height than a region of the substrate where the concave/convex portions are formed [by the thickness of the drain electrode, so claim 7 is also unpatentable. The region where the contact hole is formed has a three-layered structure of the source and gate electrodes at the lower portion thereof [note that this is not required to be directly under the contact hole; the application does not have the gate electrode directly under the contact hole] and the region where the concave/convex portions are formed has a single-layered structure at the lower portion thereof, so claim 8 is also unpatentable. A portion of the resin layer where the contact hole is formed is removed upon the exposure step to expose the layer under the removed portion of the resin layer, while the concave/convex portions having the determined angles are formed on the resin layer, so claim 10 is unpatentable.

20. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Tanaka et al.*, U.S. Patent No. 6,509,942 in view of *Okumura*, U.S. Patent No. 6,894,747 and *Ichimura*, Japanese Patent Document No. 09-090426 and further in view of *Shimada et al.*, U.S. Patent No. 6,147,722.

The reflective electrode and the source electrode come in contact with each other through the contact hole in the above device, but the references are apparently

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silent on the width of the contact hole. *Shimada* discloses an analogous contact hole which is "typically about 4 μm " in width [col. 18, lines 55-67]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such a width, motivated by *Shimada*'s teaching that this is an appropriate width for contact holes which produces a good quality display. Claim 13 is therefore unpatentable.

Allowable Subject Matter

21. Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not disclose the device of claim 12, in particular the additional limitation that the organic insulating film consists of a central contact hole and a parasitic contact hole. Claim 12 would therefore be allowable if rewritten appropriately.

Election/Restrictions

23. Applicant's election of invention I, claims 2-4 and 6-15 in the reply filed on 19 May 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). (The examiner agrees with the

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applicant that patentability of the generic claim 1 would overcome the present restriction requirement, but this is not an error in the restriction requirement.)

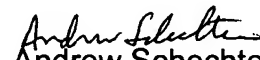
24. Claims 5 and 16-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Schechter whose telephone number is (571) 272-2302. The examiner can normally be reached on Monday - Friday, 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Andrew Schechter
Primary Examiner
Technology Center 2800
23 July 2005